BRILL

Trading Ships of the South China Sea. Shipbuilding Techniques and Their Role in the History of the Development of Asian Trade Networks
Author(s): Pierre-Yves Manguin
Source: *Journal of the Economic and Social History of the Orient*, Vol. 36, No. 3 (1993), pp. 253-280
Published by: BRILL
Stable URL: http://www.jstor.org/stable/3632633
Accessed: 17/06/2014 01:31

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at http://www.jstor.org/page/info/about/policies/terms.jsp

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

BRILL is collaborating with JSTOR to digitize, preserve and extend access to *Journal of the Economic and Social History of the Orient.*

http://www.jstor.org

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

Journal of the Economic and Social History of the Orient, Vol. XXXVI

TRADING SHIPS OF THE SOUTH CHINA SEA

Shipbuilding Techniques and their Role in the History of the Development of Asian Trade Networks[1])

BY

PIERRE-YVES MANGUIN

Ecole française d'Extrême-Orient
Paris

The South China Sea is the first leg of the long distance trans-Asian trade route leading from China to the Mediterranean. It fed into this route the products of its own interregional exchange network. To its north, natural and manufactured products from the vast Chinese mainland were gathered in the harbours of the southeastern and southern provinces to be shipped, through various stages, to South-East Asia, the Indian Ocean countries, the Middle East and Europe. Further to its south and east, the wide variety of tropical and equatorial climes of South-East Asia produced an array of trade goods that were in high demand the world over. The peoples living around the South China Sea, another "Mediterranean" in its own right, were among the shippers and traders that kept this major trade route of the Old World in lively operation.

The Chinese participation in the history of South China Sea shipping has been thoroughly investigated—and over-emphasized—for many years. However, the South China Sea, in its broadest geographical setting, also comprises the South-East Asian maritime

---

1) An earlier version of this article was read at the Sailing Ships and Sailing People Conference held at the Western Australian University in January 1987 I wish to thank Professor O W Wolters, Dr W H. Scott and Ms. J Drakard for their critical comments. Indonesian shipwreck sites mentioned in this paper were excavated within a cooperation program between the Indonesian National Research Centre for Archaeology and the Ecole française d'Extrême-Orient, with financial assistance of the Ford Foundation.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

expanses to its South and East. Serious research on the maritime history of South-East Asia started only three decades ago, and it was only in the late sixties that the dynamic role played by the South-East Asian peoples in shaping these trade networks was fully acknowledged by historians. In his important book on *Early Indonesian Commerce* (1967), O. W. Wolters was instrumental in shifting attention from activities directed from outside the region to early Malay World shippers and traders.

I shall examine this general problem from a different angle and will attempt to answer a question which needs to be posed in clear terms: did polities around the South China Sea master the ocean-going techniques that would have allowed them to play the major economic role outlined above? Assuming the evolution of socio-economic patterns is intimately connected with technical developments, what will then be considered here is the historical evolution of shipbuilding techniques, that is the development among South-China Sea peoples of the technical skills necessary to build the vessels that were used in their long-distance maritime trade ventures[2]). This is not to say that technological innovation in the field of shipbuilding was the only or even the main force behind economic development in the region. That would have been determined as much by the overall Asian social, political and economic ''conjoncture''. However, to ascribe a truly dynamic role in the shaping of these trade networks to communities in the South China Sea—and particularly to those of Insular South-East Asia—necessarily implies that those skills were present which would allow for significant fleets of trading ships to be built.

My argument will be largely based on recent developments in the field of maritime archaeology. Due to the scarcity of written sources, the substantial progress which has been made in the history of South-East Asian shipping during the past few years has been largely depen-

---

2) The development of navigational skills is another important topic that would deserve in depth studies. The lack of sources for the earlier periods, however, will remain a formidable obstacle for such research.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

dent on dramatic advances in maritime archaeology. This is only partly true for China, rich in written sources, and where little progress has been made in maritime archaeology after the 1970's. In dealing with South-East Asia, emphasis will be laid on the Western part of Insular South-East Asia, that is in or around what is known as the "Straits Zone". This is the compulsory thoroughfare on the trans-Asian sea route, which also happens to be the area where major port settlements and trading states developed in direct connection with regional and long distance trade networks.

I. - THE 1st MILLENNIUM A.D.: SOUTH-EAST ASIAN DEVELOPMENTS

Regional trade networks of South-East Asia—some of them involving long distance exchange patterns—appear to have been forged long before Indian or Chinese religious or political influences were felt around the beginning of the Christian era. In the last few centuries B.C., the diffusion into the whole region, as far as New Guinea, of artifacts such as north Viêt-nam Dông-son bronze drums and axes are proof of the existence of such long-distance trade networks. Moreover, the fact that boats and trade played a crucial role in South China Sea societies is obvious from the recurring boat symbolism which appears in early artifacts, in boat-burial rituals and in many other South-East Asian cultural contexts[3]). Burial rituals involving inhumation inside dug-out canoes or plank-built small boats appear repeatedly in archaeological sites of the Malay Peninsula in association with bronze and iron artifacts, as they do in Dôngsonian sites in Vietnam[4]). These represent the earliest boat remains of the South China Sea. They are, however, very small vessels that could not have been connected with the kind of long distance maritime trade discussed here. Recent research on archaeological data from the turn of

3) Tenazas 1973, Manguin 1986, 1991.
4) Evans 1928, 1932; Peacock 1979; Pham Quôc Quân et al. 1981.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

the 1st millennium A.D. has brought to light sustained trade patterns between Indian shores and Southeast Asia and what may well be incipient trading states on the west coast of the Malay Peninsula that appear to have traded as far as Southern China and across the Bay of Bengal[5]).

The sewn-plank and lashed-lug vessels of Insular South-East Asia

Seacraft that had their planks and frames fastened together by way of vegetal fibres were or still are to be found in most areas of the world, including ancient Europe[6]). The Indian Ocean remained until very recently the repository of such techniques[7]). But Insular Southeast Asia (and its cultural extensions into the Pacific and the Indian Ocean) also has a specific tradition of sewn and lashed hulls, technically comparable only to that of ancient Scandinavia[8]).

The earliest dated large boat structure known so far in Southeast Asia was found in the 1920's at Pontian (Pahang), also on the Malay Peninsula[9]). After many vicissitudes, it has been exposed again to the public in the Pahang Museum at Pekan. A sample of the hull was taken for ^{14}C dating and yielded a 260 to 430 A.D. date after calibration[10]). Despite the fact that this dating was carried out long after the remains were exposed in 1926, the result accords with the

---

5) Christie 1990 on the identification of the incipient states of the Malay Peninsula; Glover 1989; Ray 1989, 1990

6) Pomey 1981, McGrail & Kentley (eds.) 1985, Hornell 1946, Johnstone 1980, Greenhill 1976.

7) The best overview on modern *dhow* type vessels of the Indian Ocean is that of Hawkins 1977 See also the numerous works by James Hornell. B. Greenhill (1976) provides a comprehensive technological introduction to the questions raised. J Lewis (1973) has an excellent historical introduction to their use. See also Manguin 1986 for a reappraisal of 13th-16th century sources for the area.

8) Comparisons between Scandinavian and Southeast Asian shipbuilding techniques were first dealt with by Hornell (1935 and 1946: 199-213). This interesting coincidence is, of course, fortuitous.

9) Evans 1927, Gibson-Hill 1952; Manguin 1985· 333-335, 1985a; Manguin & Nurhadi, forth(b).

10) Sample n° BM-958: 1657 ± 60 BP (Booth 1984: 203) (calibration after Stuiver & Pearson 1986).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

dating of ceramics that were found on the site by Evans. The latter are similar to some of those discovered at Oc-eo, in southern Viêt-nam, which gives them a broad 1st to 6th century A.D. age[11]). I was recently able to identify some badly damaged pieces of timber kept in the Wat Khlong Thom Museum (Krabi province, southern Thailand) as part of a similar ship structure. No dating has been carried out on these, but a tentative indication of their age is given by their close similarities with the Pontian boat and their apparent association with the bead production site of Khuan Luk Pat, which dates from the first half of the 1st millennium A.D.[12]).

Comparable ship structures were also found in Butuan (Northern Mindanao, Philippines): a somewhat unreliable ^{14}C analysis gives one of them a 260 to 550 A.D. date, whereas another similar vessel is given a 1270 to 1410 A.D. date after calibration[13]). Remains of a few more similar vessels (in the shape of planks and a rudder) were excavated near at Sambirejo (downstream from Palembang, South Sumatra) in 1988: ^{14}C analysis yielded a time range in between 610 and 775 A.D. after calibration[14]). In 1989, a number of badly damaged planks belonging to large sewn-plank ships were recovered during two rescue operations near Medan (at Paya Pasir, the harbour site of the well-known urban settlement of Kota Cina, North Sumatra) and at Kolam Pinisi (Palembang, South Sumatra). The first remains are dated to the 12th-14th centuries A.D. by associations with ceramics found locally and at Kota Cina. ^{14}C analysis of a timber from the second site yielded a 434 to 631 A.D. calibrated

11) Malleret 1959-63, II.118 & pl. lxxiii.

12) Veraprasert 1987, and unpublished report to the Fondation de France, 1984, Manguin 1985a.

13) Samples nos. GaK-7744 (1630 ± 110 BP) and GaK-7742 (640 ± 110 BP) (calibrations after Stuiver & Pearson 1986); Philippine Delegation 1985; Scott 1982; Cembrano 1988. A third date from the same site is completely out of range (GaK-7743 210 ± 90 BP, i.e. 1740 ± 90 AD before calibration). Recent work on the same site in Butuan has revealed further comparable ship structures that will, it is hoped, yield more reliable ^{14}C dates.

14) Sample no.. Gif-7871, 1350 ± 50 BP (calibration following Pazdur and Michczynska 1989); Manguin 1989· 205

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

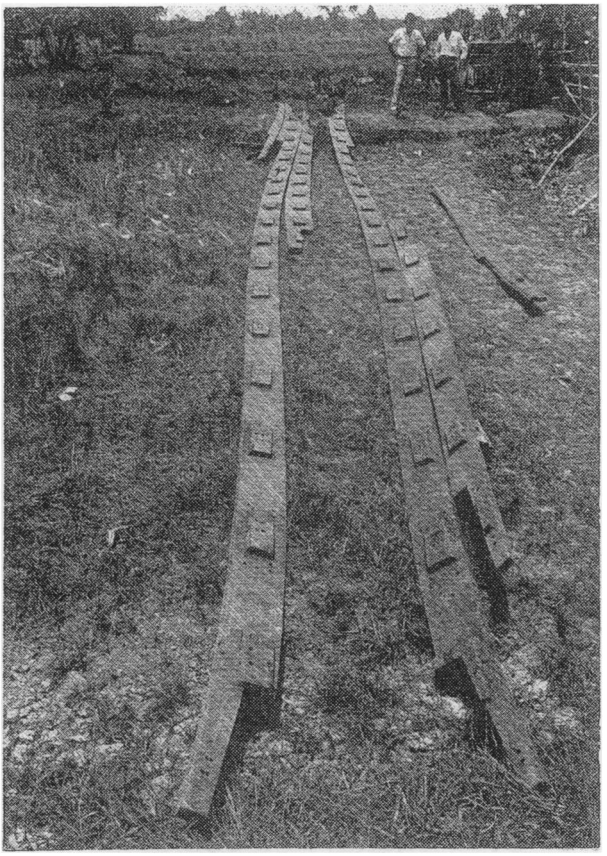

Photo 1. — Reconstruction of the Sambirejo sewn-plank boat.

date, which places this large vessel firmly into immediate pre-Sriwijayan times[15]).

These ship structures found in archaeological contexts all belong to one single specific technical tradition. Their hulls were built by raising planks on each side of a keel-piece that shows clear signs of having evolved from a dug-out base (thus pointing to a development from an earlier simple dug-out canoe). Moreover, all or part of their com-

15) Manguin 1985a, 1989; Manguin & Nurhadi, forth(b). Smaller boat remains, comparable to those at Butuan, were also found at Paya Pasir. The ^{14}C date of the Kolam Pinisi site is still unpublished (Sample no. Gif-8483: 1510 ± 50 BP).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

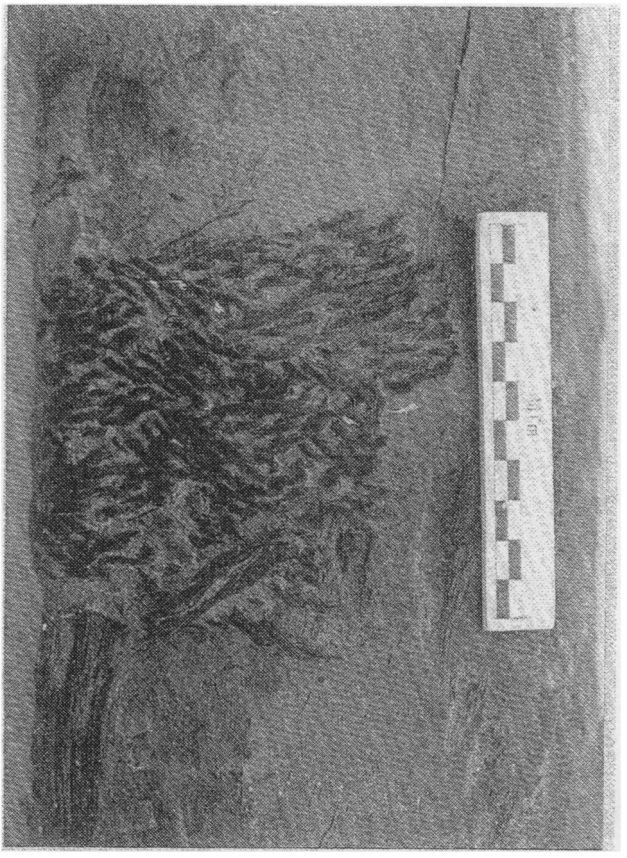

Photo 2. — *Arenga* fiber lashing on a frame from a ship at Paya Pasir.

ponents were held together by vegetal stitches or lashings (the fiber of the sugar palm, *Arenga pinnata, ijok* in Malay, *cabo negro* in the Philippines). This technique is known from textual sources to have been in use in early South-East Asia and has survived under a variety of forms in scattered areas over most of the region, from Hainan and Viêt-nam to the Philippines and Eastern Indonesia, well into the 20th century[16]). Vessels assembled in such a way are conventionally des-

16) Evidence on ancient and modern South-East Asian sewn-plank craft is discussed at length in Manguin 1985

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

cribed as belonging to the sewn-plank type when the planks with which their hulls are built up are held together by way of stitches of vegetal fiber passed through holes drilled near the edges (within the seams, not visible outside, which is the common South-East Asian technique; or rarely across the planks, thus visible from the outer side of the hull, the Indian Ocean way). The lashed-lug technique that is also associated with most of these vessels has protruding cleats or lugs (often called *tambuku* in the Malay World) carved out on the inner side of the planks, with holes hollowed out in them, so as to be able to lash them—and the planks they are part of—to sets of more or less flexible ribs and/or transverse thwarts.

The two complementary techniques (sewn-plank and lashed-lug) are found associated in what seems to be the earlier stages of the development of this shipbuilding tradition: the Khlong Thom and Pontian boats had their planks sewn together and then lashed to the frames (and thwarts?) by way of such lugs. That of Pontian is particularly interesting in that it illustrates a transitional stage: the sewing of the planks has started giving way to the use of wooden dowels; these, however, are still far apart, and could only have prevented the planks from sliding off one another. The use of wooden dowels nevertheless represents a first stage in a process that will provide more rigidity to the boat hull. In a later stage, illustrated by the Butuan remains or on modern Eastern Indonesian fishing boats, the sewing of the planks together has totally given way to dowelling; only the lashed-lug technique remains in use to fasten frames and thwarts to the planks[17]).

The vessels found at Pontian, Khlong Thom, Sambirejo and Butuan, together with the smaller ones at Paya Pasir, would not have been very large (approximately 12m long for the Pontian one, some

17) Some—but seemingly not all—of the known examples of dowelled structures had small locking pins inserted across the planks and the dowels: they prevented the planks from riding apart, thus alleviating the pressure on the lashings, and provided an additional—and significant—measure of rigidity

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

20m for those at Butuan, some 26m at Sambirejo). Those at Butuan and Sambirejo, the best preserved, appear to have belonged to a class of light and swift vessels (that could be compared to the Malay *lancang*—i.e. "swift"—of modern times). They could nevertheless easily have been smallish coastal or inter-island traders: the Pontian boat is, in fact, associated with trade items known to have also been found across the Gulf of Siam. The ship remains found at Palembang and Paya Pasir, on the other hand, judging from the thickness and size of the planks and frames recovered, could only have belonged to large and sturdy vessels.

Textual evidence further supports the identification of a sewn-plank tradition for large ships in early Insular South-East Asia. A Chinese book on South-East Asian flora, written in 304 A.D., when describing the sugar palm (*Arenga pinnata*), states that "the bark can be made into ropes which become pliable in water. The [South-East Asian] foreigners use these to bind timbers together in boats"[18]). These ropes are of course the familiar *tyok* of ancient and modern South-East Asian shipbuilders. We have here, then, a clear statement from the early 4th century A.D. concerning local sewn-plank craft, which is roughly contemporary to many of the sites where such craft were excavated.

Chinese sources of the 1st millennium A.D. provide us with other excellent descriptions of what Chinese authors of the time called the *kunlun bo* (i.e. "South-East Asian ships") that visited Chinese harbours and took Buddhist pilgrims on board en route to Sriwijaya (on Sumatra) and India[19]). The earliest such source dates from the 3rd century A.D.; it is most comprehensive and the passage on multiple masts and sails has a surprisingly modern resonance to it:

---

18) Hui-Lin Li 1979: 90

19) These sources were first published by Pelliot (1925); Needham (1971 459, 600) made use of these texts, but generally failed to recognize or accept the South-East Asian identity of the builders of the *kunlun bo*. These texts were discussed again in Manguin (1980: 274-276).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

> The people of foreign parts call ships *bo*[20]). The large ones are more than fifty meters in length and stand out of the water four to five meters (...). They carry from six to seven hundred persons, with 10,000 bushels of cargo [c. 600 tons deadweight].
>
> The people beyond the barriers, according to the size of their ships, sometimes rig [as many as] four sails, which they carry in row from bow to stern. (...) The four sails do not face directly forward, but are set obliquely and so arranged that they can all be fixed in the same direction, to receive the wind and to spill it. The pressure [of the wind] swells [the sails] from behind and is thrown from one to the other, so that they all profit from its force. If it is violent, they diminish or augment [the surface of the sails] according to conditions. This oblique [rig], which permits the sails to receive from one another the breath of the wind, obviates the anxiety attendant upon having high masts. Therefore [these ships] sail without avoiding strong winds and dashing waves, by the aide of which they can make great speed.

A second such text, from the eighth century, was written by a Chinese monk, in a commentary to the Buddhist Canon:

> The *bo* are sea-going ships. They lie six or seven feet deep in the water. They are fast and can transport more than 1,000 men, apart from cargo. They are also called *kunlun bo*. Many of those who form the crews and technicians of these ships are *kunlun* [Southeast Asian] people.
>
> With the fibrous bark of the coconut tree, they make cords which bind the parts of the ship together (..). Nails and clamps are not used, for fear that the heating of the iron would give rise to fires. [The ships] are constructed by assembling [several] thicknesses of side-planks, for the boards are thin and they fear they would break. Their length is over sixty meters (..). Sails are hoisted to make use of the winds, and [these ships] cannot be propelled by the strength of men [alone].

To sum up, on the basis of these two graphic descriptions, the constructional features of these Southeast Asian ships may be listed as follows:

1. They were large ships, even by modern sailing standards.
2. No iron was ever used in fastening their components together.

---

20) There is as yet no satisfying etymological explanation for the Chinese transcription *bo* of a *kunlun* word.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

Two texts clearly refer to fastening with vegetal fibres, which is confirmed by the archaeological evidence cited above.

3. They had several layers of planks (a feature common in later South China Sea ships).

4. They were rigged with multiple masts and sails, a sure indication of sophisticated high-seas sailing skills (and again a feature of later ships of the region).

5. They most probably had no outriggers, for such a conspicuous device would no doubt have struck the minds of Chinese witnesses, unfamiliar with this kind of exotic gear; moreover, it is difficult to conceive the fitting of outriggers on such large vessels.

The iconographic evidence for ships of the first twelve or thirteen centuries A.D. is relatively poor. It should also be noted that, with very few exceptions, iconographic representations of sailing vessels teach us little of the structure and size of the craft depicted (they provide us with no clear indication, for example, on the fastening technique: were their timbers sewn, lashed, dowelled or nailed?). What one learns from these depictions concerns the superstructure: how many masts and sails were used and what their shape was, the position and number of rudders, and whether or not outriggers were present. Only some of these elements stand any chance of ever being found in an archaeological context and there is therefore a need to reappraise carefully the widely scattered iconographic evidence, in the light of recent archaeological finds. The well-known Borobudur reliefs—representing various ships both with and without outriggers—, a Dvaravati seal from Nakorn Pathom and a stucco relief from Uthong (both in Thailand), the various rock-paintings that have been reported all over South-East Asia all need to be reconsidered and analyzed, together with the new evidence at hand. At present, what may be said with certainty is that they illustrate the widespread use of tripod (or bipod?) masts, of quarter rudders, of at least two types of sails (the canted square-sail and a kind of lug-sail, both illustrated in the Borobudur reliefs; a spritsail seems to be a current feature of the time); outriggers are often but not always found, and the question

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

remains open as to their use in the largest ships (though, as already remarked, I would tend to think they were not used on the latter)[21]).

Some plank and frame remains dating from the early 2nd millennium A.D. recovered at the harbour-site of Paya Pasir, the sturdiest found so far that were part of sewn-plank ships, would have belonged to fairly large vessels (a very rough estimate would put them at some 30m in length; their planks are 37cm wide and 7,5cm thick[22])). This is not quite as large as the 50m long *kunlun bo*, carrying hundreds of passengers, described by the Chinese. For the time being, we thus have to rely on the two corroborating Chinese texts of the 3rd and 8th century A.D. quoted above. Considering the technical precision of these descriptions, and their general agreement with what we know of Southeast Asian vessels, I see no intrinsic reason to doubt their accuracy. Moreover, as will be seen below, such large vessels were common in later centuries, at a time when written sources and archaeological evidence are abundant enough to be fully trusted. Finally, the various states that dominated the late first millennium A.D. historical scene in Insular South-East Asia, prominent among which was the Malay maritime polity of Sriwijaya, were no doubt complex enough polities to provide sufficient financial means, manpower and organisational capacities to succeed in building commercial fleets of such large vessels. If the 3rd century A.D. Chinese text quoted above is to be fully trusted, then one has to conclude that the successful implementation of such skills could only have been the outcome of a long technical evolution; and that, consequently, late 1st millennium B.C. incipient states must have started dominating these sophisticated seafaring techniques quite early in their history, if they were to build such giants of the sea in the first few centuries A.D. It would therefore make sense to credit the building of these early ships to incipient coastal states such as those that appeared on the Malay Peninsula coast around the beginning of the Christian era.

21) The seal is illustrated in Smith & Watson 1979, pl. XIb. The stucco relief is now kept at the Uthong Museum. On the reliefs found in Sulawesi caves (Indonesia), see Kosasih 1984.

22) This is discussed in more detail in Manguin 1989: 209

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

II. - THE 2nd MILLENNIUM A.D.: SOUTH-EAST ASIAN, CHINESE AND SOUTH CHINA SEA TRADITIONS

The transition to rigidly assembled South-East Asian craft

There are no contemporary sources available as yet to document the evolution of the above South-East Asian sewn-plank and lashed-lug techniques in the early centuries of the 2nd millennium A.D. When textual and archaeological evidence starts appearing again in the 13th/14th century, techniques used for building the large trading ships have undergone a radical evolution: sewing and lashing of the component parts of ship structures have given way to assemblages making exclusive use of planks and solid frames and bulkheads fastened with wooden dowelling (and iron nailing in some cases, as will be seen below). There is therefore no way, as yet, to precisely document the adoption—no doubt progressive—of the new techniques. There are, however, some elements to illustrate this passage: we have seen that the Pontian boat indicated, as early as the 3rd century A.D , the progressive adoption of dowelling to fasten the planks together and that other contemporary or modern craft illustrated the completion of this stage. Small 19th and 20th century craft of Eastern Indonesia also provide evidence of the progressive change from lashed-lug fastening to solid frames dowelled to the planks[23]). The latter technique is precisely that which is described in detail in early 16th century Portuguese sources.

Most of these Portuguese sources refer to a widely represented trading ship which they called *junco*, an obvious and regular Por-

---

23) Barnes 1985, Horridge 1982. I recently carried out field work in the Maldives, and found evidence to prove that the shipbuilding tradition there used to be of the Southeast Asian sewn-plank and lashed-lug type (as opposed to an Indian Ocean sewn-plank tradition). Planks are now fastened with wooden dowels and the recent adoption of rivets for fastening the latter to the frames parallels that hypothesized in Southeast Asia (where dowels are used instead). An article on the subject is forthcoming.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

tuguese transcription of Malay or Javanese *jong*[24]). Malay classical texts such as the *Sejarah Melayu*, that are approximately contemporary with 16th century Portuguese descriptions, often mention the existence of these trading *jong* However, to the best of my knowledge, no technical information may be gathered on ship design from such local sources[25]).

As soon as they arrived in South-East Asian waters, the Portuguese were confronted with these *jong* which, to their surprise, were more often than not larger than their own largest ships. When they first entered the Straits of Melaka, they battled against a Sumatran trading *jong*, the deck of which was higher than the tall aft-castle of Albuquerque's admiral ship, the famous "Flor de la Mar". Very soon, they were to gain first hand knowledge of these seaworthy craft by making extensive use of them in their own trading ventures in the area. This in turn provided us with quite a number of reliable testimonies on these *jong* Here is a list of their basic features:

1. Their tonnage was considerable, at least by European standards of the time. There are sufficient indications in the texts to allow us to ascertain an average burthen of 350 to 500 tons deadweight; the largest occasionally reached 1,000 tons and carried a thousand men aboard.

---

24) Most of what is written here on the 16th century *jong* is summarized from Manguin 1980, in which references to primary sources are given in detail. That article, however, was written before archaeological finds began to appear· corrections and additions to it will be found in Manguin 1984 and 1989

25) The earliest mention I could find of the word *jong* appears in an Old-Javanese inscription of the 11th century AD (Brandes 1889). This practically excludes the alleged Chinese origin for the Malay word and that for its post-14th century offsprings in European languages such as *junk, junco, jonque.* Pelliot already had rejected the Chinese word *chuan* as a possible etymon for *jong* ("*tch'ouan* est exclu comme imprécis, et phonétiquement peu satisfaisant", Pelliot 1933· 446-447). What we have here is most probably a word of Malay or Javanese origin. A proper linguistic and philological study should nevertheless be carried out on its precise derivation before any solid conclusion can be reached (the word, as far as I know, has not been reconstructed into proto-Malayo-Polynesian or proto-Austronesian).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

2. The *jong* were built without a single piece of iron; their planks and frames were fastened exclusively with wooden dowels, a technique which could still be observed in Sulawesi and Madura shipyards in the early 1980's, applied to large traders of up to 250 tons.

3. Multiple sheathing of the hull seams also to have been characteristic of these trading craft (the *kunlun bo* were already said to have multiple layers of planking).

4. Instead of the central, axial rudder that had only recently become a familiar feature of European and Indian Ocean craft or, since at least the early 1st millennium A.D., of Chinese vessels, Malay World ships of the 16th century carried two lateral rudders, as they still do these days or as may be witnessed on the 8th century Borobudur temple reliefs.

5. These *jong* had multiple masts, usually from two to four, plus a bowsprit (on which a spritsail was rigged, again as on the Borobudur reliefs). The sails seem to have been of the same two types found in 1st millennium illustrations: the canted square-sail and the lug-sail.

During the first quarter of the 16th century, the main builders of these large vessels were to be found in the harbour-cities of Rembang and Cirebon on the northern Javanese coast, on the southern coast of Borneo, and in Pegu, in the Gulf of Martaban, all three areas being close to teak growing forests. Unfortunately, no such Southeast Asian *jong* has yet been found in an archaeological context and we thus have to rely for the time being on the evidence provided by written sources alone.

The development of an ocean-going Chinese navy

The vast network of large rivers, lakes and canals that criss-cross the Chinese mainland, together with a fairly long coastline, provided an environment favorable to the development of shipbuilding and sailing techniques. Such Chinese traditions have long been known, by scholars as well as by the general public, to have been highly sophisticated and to have provided the world with original, often uni-

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

que solutions to the kind of problems that are posed when large ships have to be built and sailed. The earliest Middle Eastern and European travelers to the Far East also have left us fullfledged records of their journey (such as Ibn Batutta or Marco Polo). They have provided us with often quoted accounts of the 12th-14th century large Chinese vessels they boarded. Historians systematically used these accounts to reconstruct early developments of Chinese shipbuilding techniques, together with the rare technical descriptions the Chinese left us of their own craft and observations of modern sailing vessels[26]).

The picture that emerged from most of these works was that of a rather uniform shipbuilding tradition, the main characteristics of which may be summarized as follows (limiting ourselves to the larger trading vessels):

1. The general structure of the hull is said to be comparable to that of a piece of bamboo split in two along its length: the nodal walls inside the plant are like the transom bow, stern and bulkheads that divide the hull of Chinese junks into watertight compartments. The bottom of the hull is flat or rounded, but has no true keel. Frames are usually not present, as the bulkheads themselves constitute the transom structural elements of the hull.

2. Planks were assembled with iron nails and clamps (the precise date of adoption of iron to fasten planks it not made clear in Needham's study, but appears to be present by the 8th century A.D.). Multiple sheathing of the hull is often reported.

3. From at least the 2nd century A.D. onwards, the axial, suspended rudder was in common use in Chinese craft, some ten cen-

---

26) The literature produced on the subject in the past century or so is immense. J Needham's (1971) monumental work on Chinese nautics offers by far the most scholarly synthesis on the subjects of Chinese shipbuilding and navigation. His propensity to view the Chinese as the initiators of all things and his constant references to the superiority of Chinese over the rest of the world's techniques does at times detract from his argument. More modest in scope, but less biased, Dars' unpublished dissertation provides a healthy alternative to Needham's reference work (1973, Dars 1979 is a short summary of his earlier thesis).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

turies before a comparable—though not identical—steering gear was adopted in the West and in the Indian Ocean.

4. Lug-sails (with rigid battens) were in general use since the early centuries of the 1st millennium A.D.

The trouble is that such characteristics were soon applied in Western travelogues as a kind of trade-mark to all vessels found east of the Melaka Straits, irrespective of time or region of origin. The word *junk* itself and its cognate forms in European languages became closely associated with the above type of Chinese craft (to the extent that a Chinese etymology was forged, as we have seen). However, such a generalization fails to account adequately for the history of Chinese shipbuilding techniques, not to mention those in use elsewhere in the South China Sea.

There is no further need to demonstrate that China did indeed possess all the necessary skills to build traders or warships quite early in her history. However, various scholars have established that until the last centuries of the 1st millennium A.D. these skills were applied to build only riverine and coastal vessels (some of them, no doubt, of substantial proportions). It was therefore only after the establishment of the Song dynasty in the 10th century, when the Chinese state started developing into a powerful maritime power, that the large ocean-going "junks" later witnessed by travelers began to be built on any remarkable scale[27]). The Chinese commercial fleet, being the instrument of a rich and highly centralized empire, no doubt soon grew into the major navy to sail the South China Sea: under the Song, the Yuan and the early Ming dynasties (12th to 15th centuries), its vessels were ubiquitous and some sailed as far as the East African coasts. The famous early 15th century Ming expeditions of Admiral Zheng He sent into the Indian Ocean large fleets of huge "treasure-ships", some of them carrying more than 1,250 tons of cargo and seemingly up to a staggering 150m long. The latter appear

27) This is made very clear in Lo Jung-pang's early articles (1955, 1969, 1970) and in the more recent work of Dars (1973, 1979). See also Wolters (1986: 35).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

to have belonged to the category of flat-bottomed, keel-less craft described above[28]). Medium-sized traders of Northern China, observed well into the 20th century, provide us with examples of this peculiarly Chinese shipbuilding tradition[29]).

The evidence for a hybrid "South China Sea tradition"

Several facts tend to disrupt the clear-cut images of "purely" Southeast Asian *jong* and Chinese "junks" outlined above. To start with, a few Chinese historical sources and the observation of modern Guangdong craft seem to point to the use of keels in some of the regular ocean-going trading vessels built in Southern China[30]). A careful study of the available evidence in Chinese sources would, in fact, probably allow for a dividing line to be traced somewhere between Southern and Northern China, with the flatbottomed, transom stem and sterns hips originating from the north[31]).

Oddly enough, it so happens that the half-dozen post 13th century ship-remains that have been properly excavated and reported on from the South China Sea all belong to a shipbuilding tradition which differs from both that of the South-East Asian *jong* described in great detail in the above mentioned early 16th century Portuguese sources and that of the keel-less, flat-bottomed Chinese craft[32]). Because it shares South-East Asian and (Southern) Chinese characteristics—in

---

28) Needham 1971. 482 ff., Mills 1970· 27-31.

29) See, among many others, the excellent 20th century accounts by Worcester (reprinted in 1971).

30) Dars 1973, 1979; Blussé 1979; Keith & Buys 1981. Needham (1971) lightly dismisses the Guangdong evidence as recent European influence.

31) Some trading ships plying Northern routes, and built in the north of China, appear to have similarly been influenced by ancient Korean ocean-going shipbuilding techniques: see Dars (1973, 1979); and Green 1983b and Green & Kim Zae Geun 1989 for reports on the 14th century ship found off the Korean coast.

32) See, among others, the various reports by Green, with Harper, Prishanchittara or Vidya Intakosai (1981, 1982, 1983, 1983a), Atkinson et al. 1989, Manguin (1982), Manguin & Nurhadi (1986, forth(a)); and Green 1983 for a description of the ship excavated in 1973 by Chinese archaeologist at Quanzhou (see also Frost, Ho & Ng 1974 for the wreck found at Sha Tsui, Hong-kong).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

variable proportions, depending on the actual origin of the ships—it has been termed a "South China Sea tradition". The sites excavated so far range from the coasts of Fujian to those of Indonesia and Thailand.

These excavations as well as evidence gathered in contemporary written sources have revealed 13th to 18th century hybrid ships differing from the expected "pure" South-East Asian or Chinese craft: their planks are always fastened by iron nails to the frames, but they may also be dowelled together by wooden pegs; some have a single, axial rudder while others have quarter rudders; their holds are separated by bulkheads, but these are not structurally essential and kept watertight as in the Chinese tradition (all have waterways with limber holes hollowed out of the bulkheads); all their hulls are V-shaped and have a keel that plays an essential structural role, a striking difference with the traditional flat-bottomed, keel-less (Northern) Chinese build[33]).

The Bukit Jakas site (Pulau Bintan, Riau, Indonesia) has one of the best preserved such ship remains in the area[34]). It could be said to belong to the Southeast Asian end of the spectrum of technical variants of the South China Sea tradition. The hull is clearly V-shaped, with a true keel. Planks are edge-joined with wooden dowels, but are fastened to the very sturdy frames by square iron nails. Two supplementary layers of planking were added when the ship grew old. The two remaining mast steps are exactly of the same type as those found in Thailand or in Southern China. The hull is divided into holds separated by non-structural bulkheads that could only have been made watertight by closing the limber holes. Timbers are all of tropical origin (mainly teak). One Chinese coin from the reign of Yunglo (1403-1424) provides a *terminus a quo* for the dating of the

33) All these technical aspects are discussed in detail in Green & Harper (1983 41-44), Manguin 1983 and Green 1986. The rest of the discussion presented here is summarized from these articles. See also Keith & Buys 1981.

34) On the Bukit Jakas site, see Manguin & Nurhadi 1986, forthcoming(a) and, in a summary form, Manguin 1989· 214-216.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

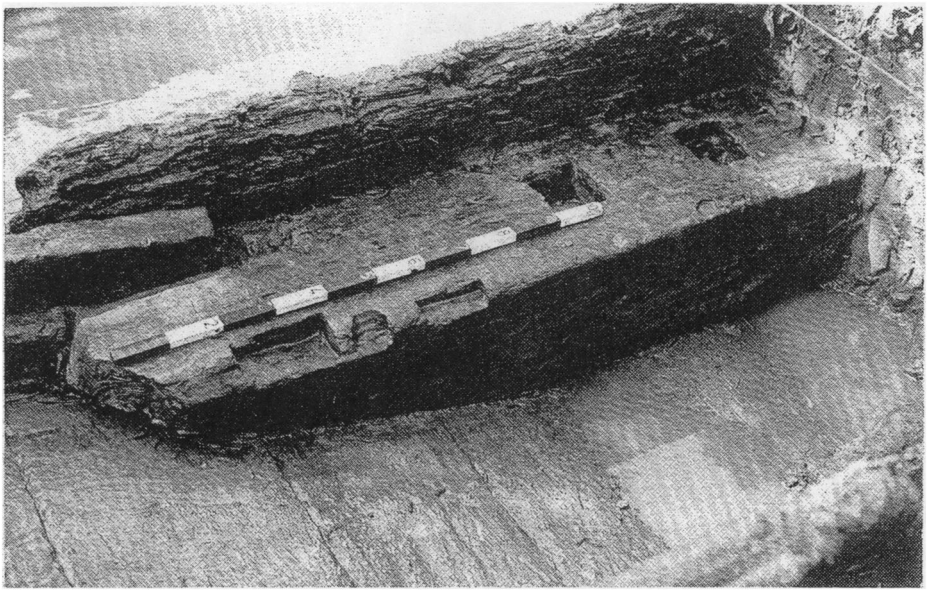

Photo 3. — Main mast step of the Bukit Jakas ship.

ship; this is in agreement with a ^{14}C analysis that yielded a time range in between 1400 and 1460 A.D. after calibration[35]). Overall length of the ship may tentatively be estimated at some 30-32m.

Various factors may have intervened to give birth to such a hybrid tradition. South-East Asian techniques developed in earlier times for high-seas navigation were most probably adopted and adapted by the Southern Chinese when they started developing their own ocean-going navy at the beginning of the 2nd millennium A.D. Large ocean-going South-East Asian ships were often seen in Southern Chinese harbours in the second half of the 1st millennium A.D. and, though we know from other sources that Indian Ocean ships were also present, the only descriptions available are those of the South-East Asian *kunlun bo*, which clearly impressed Chinese observers.

35) Dating no. Gif-5774. 490 ± 80 BP (calibration following Stuiver & Pearson 1986).

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

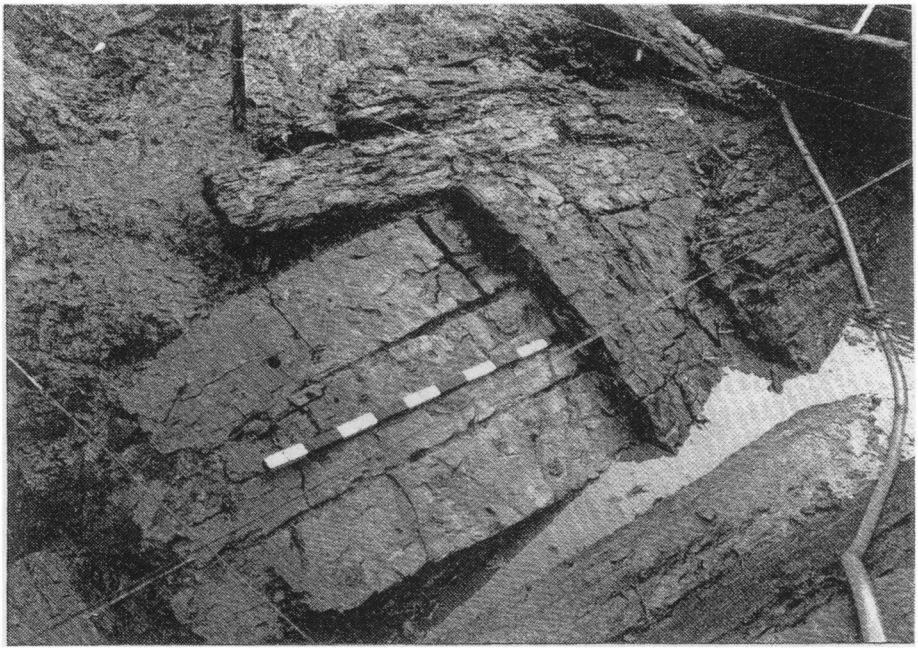

Photo 4. — Dismantling of the multiple planking of the Bukit Jakas ship.

Local shipbuilders would have no doubt continued to use techniques that were peculiar to the Chinese world and would have proved their own worth for riverine or coastal navigation: bulkheads, axial stern-post rudders, fastening with nails and clamps, etc. But they would have also benefited from the high-seas experience of the Southeast Asian peoples: V-shaped hulls with keel and stem post, multiple masts and sails, etc. Such an influence on the development of the Chinese ocean-going navy would largely explain the striking similarities between remains of ships built in Southern China and those built in South-East Asia.

Further cross-influences no doubt took place when Chinese traders started settling in South-East Asian harbours in the early centuries of the 2nd millennium, particularly when they were banned from building large ships in their home country and their commercial activities were restricted by renewed closed-country policies in the

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

15th to 17th centuries. Trading ships were then often built in South-East Asia for Chinese merchants based in Southern China or living among the growing local communities.

Recent historical and archaeological data have allowed us to identify, within the South China Sea world, a hitherto neglected indigenous South-East Asian tradition and to trace the various stages of evolution this tradition has undergone during the past two thousand years. The evidence shows an original, structurally unique technical assemblage which was developed at least as early as the Chinese or Indian Ocean neighbouring traditions. This is not to say that India or China had not developed their own sailing skills in early times: they are both known to have done so. In the Indian context, however, textual and iconographic sources alone are available: without any corroborative data from archaeological sites, they remain insufficient to define satisfactorily the early Indian shipbuilding tradition(s) and their interplay with South-East Asian techniques[36]). Documentation is more abundant in the Chinese case and, as we have seen, sufficient data is available to ascertain that a full-fledged ocean-going trading navy (as opposed to coastal or riverine shipping) was not developed before the end of the 1st millennium A.D. The Chinese, in fact, appear to have adopted some of the skills of their southern neighbours to develop what was soon to become the most powerful high-seas trading navy of the South China Sea. A hybrid Sino/South-East Asian shipbuilding tradition eventually developed for ships regularly plying South China Sea waters, that co-existed with the still lively indigenous traditions of both China and Insular South-East Asia. This appears to have been the legitimate offspring of various degrees of interaction between the diverse sea-oriented ethnic groups living on the shores of our Asian "Mediterranean".

---

36) For the Indian Ocean, see, amongst others, the recent papers by Schlingloff 1982 and Manguin 1986.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

BIBLIOGRAPHY

ATKINSON, K. et al.
1989 "Joint Thai-Australian underwater archaeological project, 1987-1988, Part 1. archaeological survey of the wreck sites in the Gulf of Thailand, 1987-1988", *International Jl. of Nautical Archaeology*, 18(4): 299-316.

BARNES, R. H.
1985 "Whaling Vessels of Indonesia", *in:* S. McGrail & E. Kentley (eds.), *Sewn Plank Boats.* — Oxford: National Maritime Museum, Greenwich, Archaeological Series No 10/BAR International Series 276, 1985· 345-366.

BLUSSÉ, L.
1980 "Chinese Trade to Batavia during the days of the V O C.", *Archipel*, 18: 195-213

BOOTH, B.
1984 "A Handlist of Maritime Radiocarbon Dates", *International Jl. of Nautical Archaeology*, 12(3): 189-204.

BRANDES, J
1889 "De Koperen Platen van Sembiran", *Tijdschrift (..) van het Bataviaasch Genootschap*, 33(1): 16-56

CEMBRANO, M. R.
1988 *Excavations in the Balangay area, Butuan, Northeast Mindanao.* — Adelaide: Papers of the Research Center of Southeast Asian Ceramics, 1988.

CHRISTIE, J Wisseman
1990 "Trade and State formation in the Malay Peninsula and Sumatra, 300 B.C.-A.D 700", in. J Kathirithamby-Wells & J Villiers (eds), *The Southeast Asian Port and Polity: Rise and Demise.* — Singapore: Singapore University Press, 1990· 39-60.

DARS, J
1973 *La marine chinoise du Xe siècle au XIVe siècle.* — Unpublished Doctorat d'Etat dissertation, Université de Paris VII.
1979 "Les jonques chinoises de haute mer sous les Song et les Yuan", *Archipel*, 18: 41-56.

EVANS, I. H. N.
1927 "Notes on the Remains of an Old Boat found at Pontian", *Jl. of the Federated Malay States Museums*, 12(4): 93-96.
1928 "On Ancient Remains from Kuala Selinsing, Perak"/"Further Notes on Remains from Kuala Selinsing, Perak", *Jl. of the Federated Malay States Museums*, 12: 121-131/139-142.
1932 "Excavations at Tanjong Rawa, Kuala Selinsing, Perak", *Jl. of the Federated Malay States Museums*, 15(3): 79-134.

FROST, R. J., HO CHING HIN & NG, B.
1974 "Sha Tsui, High Island", *Jl. of the Hong-kong Archaeological Society*, 5· 23-33

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

GIBSON-HILL, C. A.
1952 "Further Notes on the Old Boat from Pontian", *Jl. of the Malayan Branch, Royal Asiatic Society*, 25(1): 111-133

GLOVER, I. C.
1989 *Early Trade between India and Southeast Asia: A Link in the Development of a World Trading System.* — Hull: University of Hull, Centre for Southeast Asian Studies (Occasional paper, no. 16), 1989

GREEN, J
1983 "The Song Dynasty Shipwreck at Quanzhou, Fujian Province", *International Jl. of Nautical Archaeology*, 12(3): 253-261.
1983a "The Ko Si Chang Excavation Report, 1983", *Bull. of the Australian Institute of Maritime Archaeology*, 7(2): 9-41.
1983b "The Shinan excavation, Korea: an interim report on the hull structure", *International Jl. Nautical Archaeology*, 12(4): 293-302.
1985 "The Ko Si Chang One Shipwreck Excavation 1983-1985· A Progress Report", *in: Final Report, SPAFA Technical Workshop on Ceramics.* — Bangkok: SPAFA. 311-335 "
1986 "Eastern Shipbuilding Traditions: a Review of the Evidence", *Bulletin of the Australian Institute for Maritime Archaeology*, 10(2): 1-6.

GREEN, J & HARPER, R.
1982 "The Excavation of the Ko Kradat Wreck Site — Thailand", *International Jl. of Nautical Archaeology*, 11, 1982: 164-171.
1983 *The Excavation of the Pattaya Wrecksite and Survey of Three other sites, 1982.* — Fremantle: Australian Institute for Maritime Archaeology (Special publication No. 1).
1987 "The Maritime Archaeology of Shipwrecks and Ceramics in Southeast Asia", *in.* The Australian Institute for Maritime Archaeology (Special Publication No. 4), 1987 1-37

GREEN, J., HARPER, R. & PRISHANCHITTARA, S.
1981 *The Excavation of the Ko Kradat Wrecksite, 1979-1980.* — Fremantle: Western Australian Maritime Museum (reprint 1984).

GREEN, J., HARPER, R. & VIDYA INTAKOSI
1986 "The Ko Si Chang One Shipwreck Excavation 1983-1985 A Progress Report", *International Jl. of Nautical Archaeology*, 15(2), 1986: 105-122.
1987 "The Ko Si Chang Three Shipwreck Excavation: 1986", *in:* The Australian Institute for Maritime Archaeology (Special Publication No. 4), 1987 39-79

GREEN, J & KIM ZAE GEUN
1989 "The Shinan and Wando Sites, Korea. further information", *International Jl. of Nautical Archaeology*, 18(1), 1989· 33-41.

GREEN, J & VIDYA INTAKOSI
1983 "The Pattaya Wrecksite Excavation, Thailand: An Interim Report", *International Jl. of Nautical Archaeology*, 12(1), 1983 3-13

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

GREENHILL, B.
1976 *Archaeology of the Boat.* — London.
HAWKINS, C. W.
1977 *The Dhow. An Illustrated History of the Dhow and its World.* — Lymington.
HORNELL, J
1935 "Constructional Parallels in Scandinavian and Oceanic Boat Construction", *Mariner's Mirror*, 21 411-427
1946 *Water Transport, Origins and early Evolution.* — Cambridge (reprint 1971).
HORRIDGE, G. A.
1982 *The Lashed-lug Boat of the Eastern Archipelagoes.* — London: National Maritime Museum (Maritime Museum Monographs and Reports, n° 54).
HUI-LIN LI (ed.)
1979 *Nan-fang Ts'ao-mu chuang A Fourth Century Flora of South-East Asia.* — Hong-kong: The Chinese University Press.
JOHNSTONE, P
1980 *The Sea-craft of Prehistory.* — London.
KEITH, D H. & BUYS, C. J
1981 "New light on Medieval Chinese seagoing ship construction", *Intern. Jl. Nautical Archaeology*, 10(2): 119-132.
KOSASIH
1984 "The role of ships as illustrated by cave paintings", *in: Final Report, SPAFA Consultative Workshop on Research on Maritime Shipping and Trade Networks in Southeast Asia.* — Bangkok: SPAFA. 149-150.
LEWIS, A.
1973 "Maritime Skills in the Indian Ocean, 1368-1500", *Jl. of Economic and Social History of the Orient*, 16(2-3): 238-264.
LO JUNG PANG
1955 "The Emergence of China as a Sea-Power during the Late Sung and Early Ming Periods", *Far Eastern Quarterly*, 14(4): 489-504.
1969 "Maritime Commerce and its Relation to the Sung Navy", *Jl. of Economic and Social History of the Orient*, 12: 57-101.
1970 "Chinese Shipping and East-West Trade from the Xth to the XIVth Century", in: M. Mollat (ed.), *Sociétés et Compagnies de Commerce en Orient et dans l'Océan Indien.* — Paris: 167-178.
MALLERET, L.
1959-63 *L'archéologie du Delta du Mékong* — Paris: Ecole française d'Extrême-Orient (*PEFEO*, No. 43), 7 vols.
MANGUIN, P -Y
1980 "The Southeast Asian Ship: An Historical Approach", *Jl. of Southeast Asian Studies*, 11. 253-269
1982 "Report on Two New Archaeological Sites", *in: SPAFA Consultative Workshop on Archaeological and Environmental Studies on Srivijaya, Final Report.* — Bangkok: appendix 4e.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

1984 "Relationship and Cross-Influence between South-East Asian and Chinese Shipbuilding Traditions", *in: Final Report. SPAFA Workshop on Shipping and Trade Networks in South-East Asia.* — Bangkok: SPAFA. 197-212.

1985 "Sewn-plank Craft of South-East Asia. A Preliminary Survey", *in:* S. McGrail & E. Kentley (eds.), *Sewn Planked Boats. Archaeological and Ethnographic papers based on those presented to a conference at Greenwich in November 1984.* — Oxford: Greenwich National Maritime Museum (Archaeological Series n° 10/BAR International Series n° 276): 319-343

1985a "Research on the Ships of Srivijaya. A Progress Report", *in: Final Report. SPAFA Workshop on Archaeological and Environmental Research on Srivijaya.* Bangkok: SPAFA. 291-306.

1986 "Late Medieval Shipbuilding Techniques in the Indian Ocean. A Reappraisal", *Moyen Orient et Océan Indien*, III. 31-60.

1986a "Shipshape Societies. Boat Symbolism and Political Systems in Insular South-East Asia", *in:* D Marr & A. Milner (eds.), *Southeast Asia in the 9th to 14th Centuries.* Singapore: ANU/ISEAS. 187-213

1989 "The Trading Ships of Insular Southeast Asia: New evidence from Indonesian archaeological sites", *in: Proceedings, Pertemuan Ilmiah Arkeologi V, Yogyakarta 1989* — [Jakarta]: Ikatan Ahli Arkeologi Indonesia, vol. I. 200-220.

1991 "The Merchant and the King: Political myths of Southeast Asian coastal polities", *Indonesia*, 52: 41-54.

MANGUIN, P -Y & NURHADI

1986 "Perahu Karam di Situs Bukit Jakas, Propinsi Riau. Sebuah Laporan Sementara", *in: 10 Tahun Kerjasama Pusat Penelitian Arkeologi Nasional dan Ecole Française d'Extrême-Orient.* — Jakarta: Pusat Penelitian Arkeologi Nasional: 43-64.

forth(a) *The excavation of the Bukit Jakas wrecksite, 1988.* — Jakarta: Pusat Penelitian Arkeologi Nasional/Ecole française d'Extrême-Orient, forthcoming.

forth(b) *Southeast Asian lashed-lug vessels from Indonesian archaeological sites, 1988-1989* — Jakarta: Pusat Penelitian Arkeologi Nasional/Ecole française d'Extrême-Orient, forthcoming.

MCGRAIL, S. & KENTLEY, E. (eds.)

1985 *Sewn Plank Boats.* — Oxford: National Maritime Museum, Greenwich, Archaeological Series No 10/BAR International Series 276, 1985

MILLS, J V G (ed.)

1970 *Ma Huan: Ying-yai Sheng-lan. The Overall Survey of the Ocean Shores (1433).* — Cambridge: Hakluyt Society

NEEDHAM, J

1971 *Science and Civilisation in China. Vol. IV/3, Civil Engineering and Nautics.* — Cambridge.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

PEACOCK, B. A. V
1979 "The Later Prehistory of the Malay Peninsula", *in:* Smith, R. B. and W Watson (eds.), *Early South-East Asia: Essays in Archaeology, History, and Historical Geography.* — London: 199-214.

PELLIOT, P
1925 "Quelques textes chinois concernant l'Indochine hindouisée", *in: Etudes Asiatiques publiées à l'occasion du 25ème anniversaire de l'EFEO*, vol. 2: 243-263
1933 "Les grands voyages maritimes chinois au début du XVe siècle", *T'oung Pao*, 30· 237-452.

PHAM QUOC QUAN et al.
1981 "Quanh mô thuyên", *Khao cô hoc*, 2: 43-55

PHILIPPINE DELEGATION
1984 "Prehistoric Maritime Trade in the Philippines", *in. Final Report. SPAFA Workshop on Shipping and Trade Networkds in South-East Asia*, 1984. — Bangkok: SPAFA. 89-96.

POMEY, P
1981 "L'épave de Bon-Porté et les bateaux cousus de Méditerranée", *Mariner's Mirror*, 67(3): 225-244.

RAY, HIMANSHU PRABHA
1989 "Early maritime contacts between South and Southeast Asia", *Jl. of Southeast Asian Studies*, 20(1), 1989· 42-54.
1990 "Seafaring in the Bay of Bengal in the early centuries AD", *Studies in History*, 6(1), 1990· 1-14.

SCHLINGLOFF, D
1982 "Indische Seefahrt im Römischer Zeit", *in:* H. Müller Karpe (ed.), *Zur Geschichtlichen Bedeutung der frühen Seefahrt. — München: 51-85*

SCOTT, W H.
1982 "Boatbuilding and Seamanship in Classic Philippine Society", *Philippine Studies*, 30· 335-376.
1982 "Boatbuilding and Seamanship in Classic Philippine Society", *Philippine Studies*, 30· 335-376.

SMITH, R. B. & WATSON, W (eds.)
1979 *Early South East Asia: Essays in Archaeology, History and Historical Geography.* — New York, Kuala Lumpur· Oxford University Press.

TENAZAS, R. C. P
1973 "The Boat-Coffin Burial Complex in the Philippines and its Relation to Similar Practices in South-East Asia", *Philippine Quarterly of Culture and Society*, 1(1): 19-25

VERAPRASERT, Mayuree
1987 "Khlong Thom: an ancient bead and manufacturing location and an ancient entrepot", *in. Final Report. SPAFA Seminar on Prehistory of Southeast Asia.* — Bangkok: SPAFA. 323-331

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions

WOLTERS, O W
1967 *Early Indonesian Commerce. A Study of the Origins of Srivijaya.* — Ithaca: Cornell University Press.
1986 "Restudying Some Chinese Writings on Sriwijaya", *Indonesia*, 42: 1-41.
WORCESTER, G R. G
1971 *The Junks & Sampans of the Yangtze.* — Annapolis: United States Naval Institute.

This content downloaded from 195.78.108.20 on Tue, 17 Jun 2014 01:31:23 AM
All use subject to JSTOR Terms and Conditions